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BEES OF THE GENUS CENTRIS IN CALIFORNIA

(Hymemoptera: Anthophoridae)

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The anthophorid bees of the genus *Centris*[1] have been something of a problem with workers of bees for some time. The genus is a large one, and the number of names proposed for species probably exceeds the actual number of species by quite a great margin. Many species have never been properly described, if at all, while others have been described many times under many names (*e.g. Centris versicolor* Fabricius). With exception of certain tropical species, most of these bees are rather stable, and redescription has probably been the result of incorrect determinations and of not having actually seen the types of species. In this study the author has studied the types of several forms, and other names are based upon authentically determined material.

The earliest attempt to prepare a key for the determination of Nearctic *Centris* is that of Cockerell (1897) which proved to be unworkable as more material became available. The later key of Fox (1899) is still workable for determination of the species known at that time. The principal value of this work is that valid specific characters are brought into use for the first time. The tables of Friese (1900) are of no real value for our species as he relied largely upon the original descriptions and such poor characters as the color of the pubescence, body and wings, and upon size. Michener (1950) has prepared an excellent key to the subgenera.

The author wishes to express his thanks to Dr. C. D. Michener

[1] The author is herein using **Centris** in the sense of Cresson, Cockerell and other authors prior to Sandhouse (1943, U. S. Nat. Mus. Proc. 92:519-619). As Sandhouse pointed out, this name should be used for the euglossine genus which has long been called **Eulaema**, while the genus herein under consideration should be known as **Hemisia**. However, in view of the extensive literature which has been built up around use of the names **Centris** and **Eulaema** (prior to Sandhouse), C. D. Michener and I feel that it would be much less confusing if the rules of the International Commission on Zoological Nomenclature were suspended in these cases, in order that these names may be used in the same sense as they have been in the past. Dr. Michener has made an application to the Commission in regard to this matter.

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Key to California Species of Centris[2]

Females

1. Clypeus strongly protuberant, seen from side as far in front of base of mandibles as width of eyes, finely, sparsely punctate, with a large median impunctate area, black, without macula; pubescence of mesoscutum, scutellum and metanotum dark fox-red (wings pale fuliginous, subhyaline, veins and stigma black; first tergum with long erect pubescence, remaining terga sparsely pubescent; basal area of propodeum, except apex, dull, tessellate; inner mandibular margin with three long, subacute teeth, apical tooth very long, subacute) ..... *rhodomelas*
– Clypeus only moderately protuberant, often very shiny, black, red or yellow, with or without macula; thoracic pubescence varying from light fulvous to white; mandibles variable 2
2. Maxillary palpi four-segmented; pubescence mostly pale whitish, surfaces of abdominal terga hidden by short, appressed pubescence 3
– Maxillary palpi five-segmented; pubescence fulvous to ochraceous; at least four apical terga in large part bare 4
3. Large species, 13–16 mm.; mandibles tridentate; abdominal ventrites three to five with distinct apical fringes of moderately long white hairs ..... *pallida*
– Smaller, 11.5–13 mm.; mandibles quadridentate; ventrites lacking the white apical fringes ..... *tiburonensis*
4. Large species 13–16 mm.; clypeus black or with apical yellow spot; legs black or darkly rufescent; clypeus distinctly punctate; surface of second tergum obscured by short appressed pubescence 5
– Smaller 12–14 mm.; clypeus red or yellow; legs variable often red; second tergum without surface obscured by appressed pubescence 6
5. Eye, seen from side, wider than genae; clypeus bulging basally, always with a small apical yellow macula; pubescence of second tergum subappressed, pallid; ventrites three to five with pale apical fringes; coastal and desert species ..... *hoffmanseggiae*
– Eye, seen from side, no wider than genae; clypeus weakly bulging basally, with a large shiny median impunctate area, entirely black; pubescence of second tergum usually strongly appressed, usually dark or with apical and lateral areas pallid; ventrites without pale apical fringes; primarily of the San Joaquin Valley ..... *californica*
6. Greatest facial width greater than distance between the anterior ocellus and apex of clypeus; legs mostly red, pubescence black, except on anterior femora and tibiae; apical margins of terga two and three

[2]The female of **rhodoleuca** Cockerell and the male of **californica** Timberlake have not been included in this key as they apparently are unknown.

laterally with pale fasciae; clypeus, labrum, inner orbits for a short distance, mandibles except apices, red (clypeus sparsely punctate, with fine punctation on extreme lateral and basal margins; labrum deeply punctate, with shining interstices; first segment of flagellum almost as long as scape, distinctly shorter than following three segments combined; propodeum very sparsely punctate; postscutellum shinier than scutellum) ..... *rhodopus*

– Greatest facial width less than distance between anterior ocellus and apex of clypeus; legs black or dark brown, rarely lightly rufescent.....7

7. Apical width of clypeus hardly greater than its median length; labrum small, subtriangular, subacuminate at apex; sternal pubescence of thorax pale or lightly tinged with brownish..... *lanosa*

– Apical width of clypeus greater than its median length; labrum larger, semilunate, its apex broadly, roundly slightly emarginate; sternal pubescence of thorax usually strongly black or dark brownish..... *atripes*

Males

1. Posterior femora strongly swollen, one-half to one-third as broad as long; body entirely covered by long dense, shaggy, pallid pubescence; abdomen dull red basally, remainder of body dull black; legs mostly dull red ..... *rhodoleuca*

– Posterior femora usually about one-fourth as broad as long, rarely (in Nearctic fauna) almost one-third as broad as long; if body covered with pubescence, then pubescence short, integument of abdomen shining black 2

2. Maxillary palpi four-segmented; abdominal dorsum entirely hidden by short pallid pubescence 3

– Maxillary palpi five-segmented; abdominal dorsum not hidden by pubescence beyond first segment.....4

3. Larger species 13–16.5 mm.; face narrow, inner orbits strongly converging above ..... *pallida*

– Smaller species, 12–13.5 mm.; face broader, inner orbits almost parallel ..... *tiburonensis*

4. Large species, 13–16 mm.; legs and abdomen black; maculae of face pale yellow 5

– Species of smaller maximum size, usually about 13 mm.; legs often reddish; abdomen often reddish basally; maculae of face bright lemon-yellow 6

5. Clypeus strongly protuberant, as far in front of mandibular base as eye is wide when viewed laterally; first flagellar segment shorter than following four combined; supraclypeal area and underside of scape, in addition to clypeus and labrum, yellow; pubescence of vertex and thoracic dorsum often dark fox-red, but varying to fulvous..... *rhodomelas*

– Clypeus not as strongly protuberant as noted above; first flagellar segment as long as following four combined; supraclypeal area and underside of scape black; pubescence as noted above usually ochraceous ..... *hoffmanseggiae*

6. Face broad, distance from apex of clypeus to anterior ocellus no greater

than greatest facial breadth; legs pale reddish; terga two to five with at least lateral apical fringes of pallid pubescence.....*rhodopus*

– Face narrow, distance from apex of clypeus to anterior ocellus greater than greatest facial breadth; legs brown or blackish; terga two to five without pale apical fringes.....7

7. Pubescence of thoracic sternum dark brown or blackish, that of mid and posterior legs entirely black; first flagellar segment shorter than following two combined; inner orbits diverging above.....*atripes*

– Pubescence of thoracic sternum pale or with a slight admixture of brownish hairs; middle tibiae and posterior femora externally with pale pubescence; first flagellar segment as long as the following three combined; inner orbits converging above.....*lanosa*

Trichocentris Snelling, new subgenus

This subgenus is mostly closely allied to *Penthemisia* Moure from which it hardly differs except in the swollen hind legs and the heavy tibial spurs and tarsal claws. This subgenus is known only from the males of three species, one of which is apparently undescribed. One of the species included here *(C. morsei* Cockerell) does not agree too well with the other species, but rather than erect a new subgenus (which would tend to obscure the subgeneric relationships) for it, I am including it here provisionally. *Centris vanduzeei* Cockerell, described from the Gulf of California, may prove to be a *Trichocentris,* but the types will have to be restudied before this is clear. The female of *vanduzeei* has the abdomen thinly covered with erect white pubescence, with whitish fasciae on the apical margins of the terga. The face is black. The male differs from any known *Trichocentris* in that the face is entirely black. In the closely related subgenus *Penthemisia,* however, the males of a few species (e.g. *mexicana* F. Smith and *aterrima* F. Smith) have the face immaculate, so this is probably merely an interesting specific character.

If *vanduzeei* should eventually prove to be a member of this subgenus, then we have an interesting situation, for the secondary basitibial plate of the female of this species is very poorly developed, while the genitalia of the three species which I have studied have the large branched setae of the gonocoxites which are characteristic of the subgeneric complex including *Penthemisia, Centris s. str.,* and *Xanthemisia.* This would seem to indicate, therefore, that *Trichocentris* is a rather primitive type, from which this complex may have evolved. With *Trichocentris* as the most primitive type, one line of development (by retention of

the setae of the gonocoxites, shortening of the apical segments of the maxillary palpi, development of a basitibial plate with a secondary plate) leads to the *Penthemisia*, *Centris s. str.*, and *Xanthemisia* complex, while another line leads to *Wagenknechtia* and the remaining subgenera in which the males lose the branched setae and where the maxillary palpi are reduced to three or four segments, all of these segments being quite long as compared to the *Penthemisia* complex.

The characters by which *Trichocentris* may be recognized are as follows:

Mandibles slender, tridentate, inner tooth much smaller than in *Penthemisia*, acute; maxillary palpi five-segmented, two apical segments distinct from one another, fourth as long as basal, fifth longer than basal; first flagellar segment of antennae slightly longer than scape; clypeus and labrum smooth, nearly impunctate, bright lemon-yellow; first recurrent vein of forewings reaching second submarginal cell at end of basal third; hind femora swollen, one-half to one-third as broad as long (usually about one-fourth as broad as long in *Penthemisia*); tibial spurs blunt, flattened; tarsal claws dentate, the inner tooth very long so that they appear almost bifid, very stout; apical processes of seventh and eighth ventrites slender; giant branched setae of gonocoxites quite long, not as well developed as in other subgenera of this complex, arising near the bases of the gonostyli; gonocoxites without apical processes; large robust species, body usually covered with long, dense, shaggy pallid pubescence.

Type of subgenus: *Centris rhodoleuca* Cockerell, 1923.

Most of the species in this subgenus appear to be rather rare, or at least are uncommon.

CENTRIS RHODOLEUCA Cockerell

Centris rhodoleuca Cockerell, 1923. Calif. Acad. Sci. Proc. (4) 12:75. ♂.

This species was described from a male taken by E. P. Van-Duzee at Tiburon Island, Gulf of California, Mexico. I have seen material of this rare species from California (Morongo Valley, Palm Springs, Campo) and Nevada (near Arden, Clark County). Timberlake informs me, *in litt.*, that he has a specimen from Jacumba, San Diego County, California. The only floral records for this species are *Croton californica* on which Timberlake found it in Morongo Valley. According to data before me, this species flies from June 6 to August 4.

PENTHEMISIA Moure

Centris subg. *Penthemisia* Moure, 1950. Dusênia 1:390–392. Type: *Centris chilensis* Spinola.

Hemisia subg. *Penthemisia* Michener, 1950. Jour. Kans. Ent. Soc. 24:2–4.

CENTRIS PALLIDA Fox

Centris pallida Fox, 1899. Acad. Nat. Sci. Phila. Proc. 51:66. ♀.

Centris pallida callognatha Cockerell, 1923. Calif. Acad. Sci. Proc. (4) 12:78. ♀ *(new synonym)*.

Centris trichosoma Cockerell, 1923. loc. cit. ♂ *(new synomym)*.

A careful study of a large series of this species and the types of *callognatha* and *trichosoma* has resulted in the above synonomy. The *trichosoma* is identical to males of this species from other parts of its range, while the *callognatha* variation with fulvous hair on the vertex and mesoscutum can be taken along with the typical form in California, Arizona and Mexico.

This species flies during the spring and early summer on the Colorado Desert in California, and visits the flowers of *Cercidium*, *Olneya* and *Dalea*.

Pallida is a rather peculiar species, and might well belong to the subgenus described above as *Trichocentris*. Occasional males have the hind femora almost half as broad as long. The female has the mandibles tridentate and the maxillary palpi are four segmented. Whether this species falls under *Trichocentris* or *Penthemisia* must await the discovery of the females of *Trichocentris*.

CENTRIS TIBURONENSIS Cockerell

Centris tiburonensis Cockerell, 1923. Calif. Acad. Sci. Proc. (4) 12:78. ♀.

This common species, which occurs in Baja California, California and Nevada, flies in the late spring and early summer along with the superficially similar *pallida*. In Baja California, Mexico, I found this species flying in a light rain and visiting the flowers of *Koeberlinia spinosa*. One female was seen to enter a burrow in loose sand. Like *pallida*, this species also visits *Cercidium*, *Olneya*, and *Dalea*.

CENTRIS RHODOPUS Cockerell

Centris caesalpiniae var. *rhodopus* Cockerell, 1897. Ann. Mag. Nat. Hist. (6) 19:394. ♀ ♂.

Centris rhodopus var. *pulchrior*, Cockerell, 1900. Canad. Ent. 32:363. ♂.

This is the most common and well-known of our Nearctic species of *Centris* and is found in Texas, New Mexico, Arizona, Nevada, California, Sonora, and Baja California.

CENTRIS ATRIPES Mocsáry

Centris atripes Mocsáry, 1899. Termés. Füzetek 22:254. ♂.

Centris atriventris Fox, 1899. Acad. Nat. Sci. Phila. Proc. 51:68. ♀ ♂. *Preocc.*

Centris foxi Friese, 1900. K. K. Naturhist Hofmus. Ann. 15:350. *New name* for *Centris atriventris* Fox.

The presence of this species in California is marked by the capture of a single male at Brawley, Imperial County, June 21, 1953 by the author, at flowers of *Dalea spinosa*. I have seen material of *atripes* from Baja California, Sonora, Arizona, New Mexico, Texas and Tamaulipas.

CENTRIS LANOSA Cresson

Centris lanosa Cresson, 1872. Amer. Ent. Soc. Trans. 4:284. ♂.

Centris cockerellii Fox, 1899. Acad. Nat. Sci. Phila. Proc. 51:68. *New name* for *Centris hoffmanseggiae* Cockerell, ♀. not the ♂.

Centris cockerelli resoluta Cockerell, 1923. Calif. Acad. Sci. Proc. (4) 12:76. ♀ ♂ *(new synonym)*.

Cockerell erected the variety *resoluta* for the females of this species which have the clypeus reddish in color. My studies, however, reveal that this form also can be found among the so-called typical populations of New Mexico and Texas, while individuals with the clypeus pale yellow may be taken from time to time in Arizona and California.

Centris lanosa is common on the deserts of southern California and is also found in Nevada, Arizona, New Mexico, Texas and northern Mexico. This species flies in the spring and early summer, visiting *Cercidium, Krameria, Dalea* and *Prosopis*.

CENTRIS CALIFORNICA Timberlake

Centris californica Timberlake, 1940. Pan-Pacific Ent. 16:139. ♀.

This rare species, of which the male is unknown, is closely allied to *hoffmanseggiae* Cockerell, but until the male of *californica* is discovered, no definite idea of the true relationship of the two species can be formed.

Centris californica is known from Barstow, San Bernardino County, Kerman, Fresno County, and Turlock, Stanislaus County. This bee has been captured on the flowers of *Cleomella obtusifolia, Wislizenia refracta* and mustard, and capture dates range from July 14 to September 24.

CENTRIS HOFFMANSEGGIAE Cockerell

Centris hoffmanseggiae Cockerell, 1897. Ann. Mag. Nat. Hist. (6) 19:395. ♂ (not ♀).

Centris hoffmanseggiae var. *davidsoni* Cockerell, 1904. South Calif. Acad. Sci. Bul. 3:160. ♂ *(new synonym)*.

Cockerell's variety *davidsoni*, described from Banning, California, is much too poorly differentiated to be recognized as a valid form, since individuals of both types may be found together throughout the range of the species, which thus far is known only to include New Mexico and southern California. Although this is primarily a desert species, I have seen a number of specimens taken by C. D. Michener at the Hastings Natural History Reservation, Santa Lucia Mountains, Monterey County. Known floral records for this species include *Cercidium*, *Lotus*, *Prosopis*, *Penstemon*, *Dicentra* and *Larrea*.

CENTRIS RHODOMELAS Timberlake

Centris rhodomelas Timberlake, 1940. Pan-Pacific Ent. 16:139. ♀ ♂.

This is one of the most distinctive species of *Penthemisia* known to me and does not seem to be closely related to any other species. The strongly protuberant clypeus and dark fox-red pubescence of the thoracic dorsum and the most readily noted characters of this handsome species. It closely resembles *Tetralonia californica* (Cresson) in this respect.

Whereas this species has been found from Ventura County north to Yolo and Fresno Counties, it is apparently absent from the Central Valley. I have seen one male in the collection of the University of California at Davis from Putah Canyon, Yolo and Solano counties, June 2, 1949 (R. C. Bechtel). I am indebted to Dr. G. D. Butler, Jr. of the University of Arizona for allowing me to study four males of this species which he collected at Squaw Valley, Fresno County, June 20, 1953, on the flowers of a thistle. These are the northernmost records for any species of *Centris* known to me and hence are of considerable interest.